Space Weather Technical Forecast

Issued on Friday, 30 August 2024 at 12:16 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: M-class flares likely.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity has been Moderate with a peak M1.2 flare at 30/0206UTC from a new region near to the southeast limb. There are nine regions currently on the visible disc. AR3806 in the southeast remains the most complex, as a modestly sized and compact region, with a likely delta spot on the southern portion of its leading spot. Recently numbered AR3807 in the southeast has shown the most recent development, with penumbra forming on leading and trailing spots as well the emergence of intermediate spots. The other regions on the disc remain relatively simple, and mostly decaying or stable.

No Earth directed CMEs have been observed in the past 24hrs.

Solar Wind / Geomagnetic Activity: Solar wind parameters, as measured by ACE at L1, continue to show ongoing influence from a CME that arrived early on 27 Aug. Solar wind speeds persisted mostly at background levels, initially between 300-340 km/s but have steadily risen to around 370-400km/s. The density was predominantly below average, but briefly rose to just above average after 30/0730UTC. The Interplanetary Magnetic Field, Bt, was predominantly at strong levels throughout, although has briefly dropped to moderate levels at times, ranging through the period between 20 and 9nT. The north-south component, Bz, was predominantly strongly positive (northward), before turning moderately negative (southward) from 30/0745UTC. Phi angle was initially positive, but became negative (towards the Sun) from 29/1545UTC, before turning positive once more (away from the Sun) from 30/0745UTC. Geomagnetic activity has been Quiet-Unsettled (Kp1-3).

Energetic Particles / Solar Radiation: High energy (greater than 10 MeV) proton flux observed by GOES18 remained at background. High energy electron flux (greater than 2MeV) observed at GOES16 was at background. The 24-hour fluence was below the Active threshold, with 9.96e5 integrated pfu observed at 30/0000UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate activity is forecast with M-class flares likely and a slight chance of isolated X-flares.

Solar Wind /Geomagnetic Activity: There are no Earth-directed CMEs. Current CME enhancement is forecast to continue to wane. However, there is a chance of temporary weak solar wind enhancements from small coronal hole CH62/+ today (30 Aug). Another slight solar wind enhancement, from a coronal hole near centre disc, may arrive through Day 4 (02 Sep).
Geomagnetic activity is expected to be mainly Quiet-Unsettled (Kp1-3) on Day 1 (30 Aug) before becoming mainly Quiet through Days 2-3 (31 Aug-01 Sep). There is a chance of Active (Kp4) intervals and a slight chance of G1/Minor Storm intervals (Kp5) on Days 1 (30 Aug) and Day 4 (02 Sep) however, due to the effects of the lingering CME influence and possible high speed streams mentioned above.

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Energetic Particles / Solar Radiation: High energy proton flux is likely to remain at background, but with a slight chance of reaching the S1 Minor Radiation Storm level, should any larger flares occur, especially from the western disc. High energy electron flux is expected to remain at background. The associated 24-hour fluence is expected to persist below Active.

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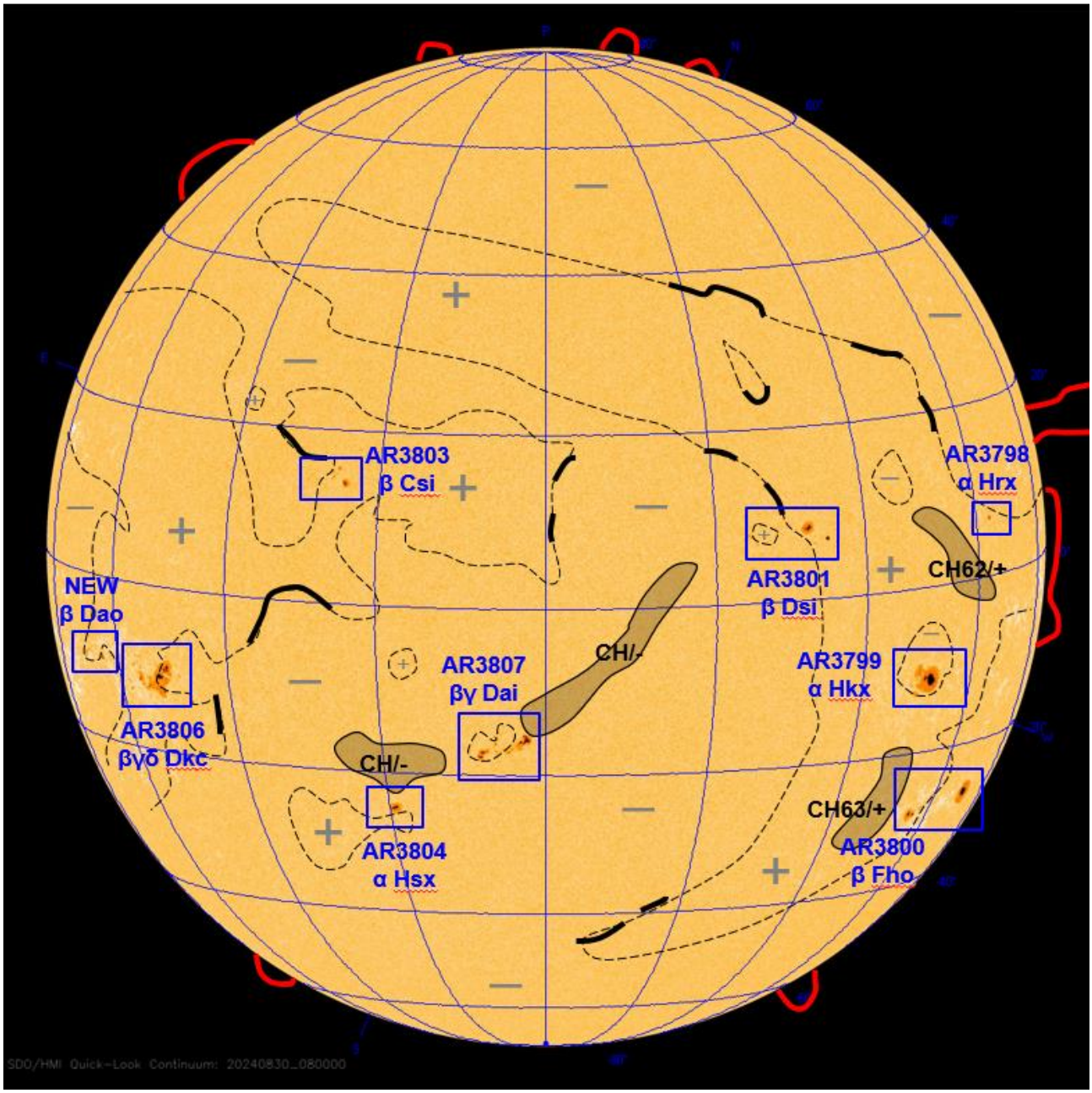
Figure 1. Solar Analysis Valid 30/0800UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

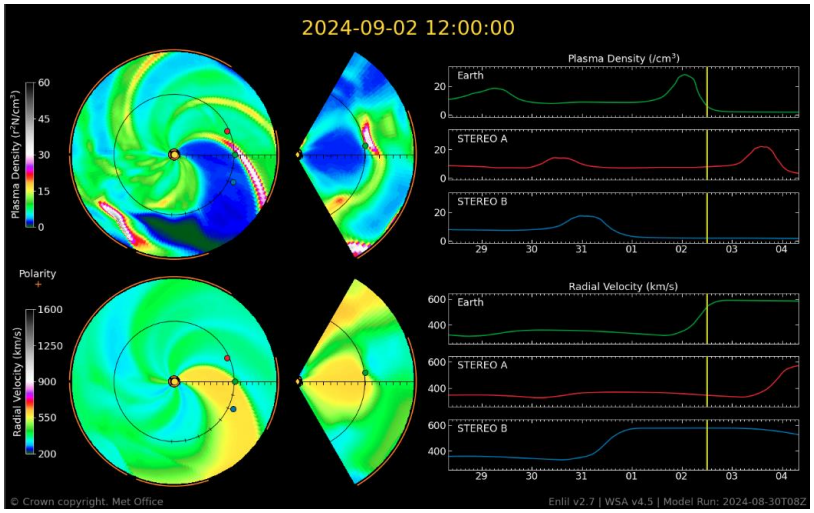
The CME that was seen leaving the Sun on 23 Aug arrived at L1 early on 27 Aug. Earth still lies within the magnetic cloud from this feature, with enhanced solar wind parameters that are expected to ease over the coming day. There are no other Earth-directed CMEs.

As mentioned above, the recent CME influence is expected to wane, however recent observations suggest the influence of CH62/+ can be added to the mix, which may help to prolong the current enhancement in the solar winds. This influence is only expected to be weak however and unlikely to be prolonged, with wind speeds perhaps reaching 400-450km/s and effects only likely occurring through Day 1 (30 Aug). The central disc coronal hole, currently unnumbered, is signaled to bring associated fast wind enhancements through Day 4 (02 Sep), although any high speed stream could possibly arrive late Day 3 (01 Sep) with speeds estimated around 400-500 km/s (less than Enlil would currently suggest).

Geomagnetic activity is expected to be mainly Quiet-Unsettled (Kp1-3) on Day 1 (30 Aug) before becoming mainly Quiet through Days 2-3 (31 Aug-01 Sep). There is a chance of Active (Kp4) intervals and a slight chance of G1/Minor Storm intervals (Kp5) on Days 1 (30 Aug) and Day 4 (02 Sep) however, due to the effects of the lingering CME influence and possible high speed streams mentioned above.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	5	5	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: MOSWOC Enlil model.



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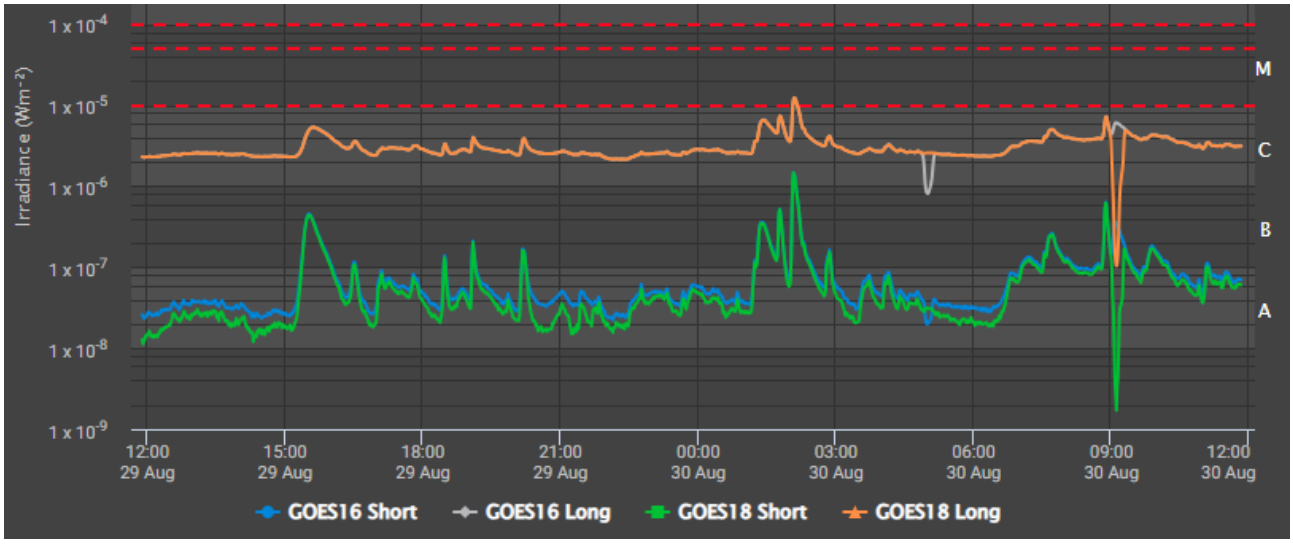
Radio Blackouts - X-Ray Flares:
There are nine sunspot regions on the visible disc. AR3806 in the southeast remains the most complex, as a modestly sized and compact but rather ragged region, with surrounding plage, with a likely delta spot on the southern portion of its leading spot. There appears to be a north-south alignment to the delta spot, which may increase the instability of the region. A new spot region is closely following this region and is gradually becoming easier to analyse, and was responsible for the largest flare of the period. AR3800 in the southwest has shown slight decay recently, with small intermediate spots fading. AR3803 has also seen some small weak trailer spots fade. The only region to show development is the recently numbered AR3807 in the southeast, which has quickly emerged in recent hours, now with penumbra on both its leading and trailing spots, as well as growth of smaller intermediate spots.

Activity is Moderate with a peak M1.2 flare at 30/0206UTC from the new region near to the southeast limb. Low to Moderate activity is expected with M-class flares likely and a slight chance of isolated X-flares, with AR3806 the most probably source.

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	60	60	60	60
Very Active	R3 to R5 X Class	No	5	5	5	5

Figure 3: GOES-16 & -18 X-ray flux.



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Solar Radiation Storms - (High Energy Protons):
High energy proton flux, as observed by GOES-18, is currently at background levels and is likely to persist at this level. There are a number of moderately sized sunspot regions in the western hemisphere which is a more favourable position to give proton enhancements at L1, should any significant flares occur. However, these regions currently lack magnetic complexity. Consequently, there is currently a slight chance of exceeding the S1/Minor Radiation Storm threshold through this period.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	10	10	10	10
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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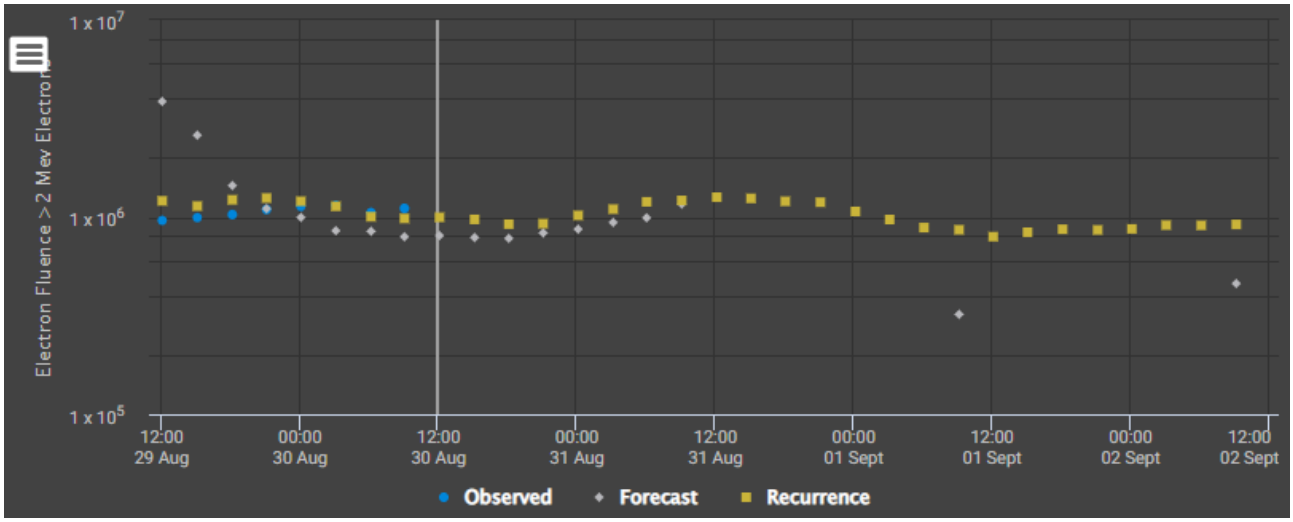
High Energy Electrons Event (≥ 2MeV):

High energy electron flux as observed by GOES-16 is currently at background. No significant wind speed increases are anticipated in the period with any coronal hole sourced enhancements expected to be weak. However, the recent coronal mass ejection arrival may have resulted in an increase in electron counts at lower orbits, which have the potential to relax toward GEO. Background flux is most likely to continue but with a chance of periods of Moderate at diurnal max.

Fluence is expected to remain below the Active (1e8 integrated pfu) threshold through the period, with MOSWOC REFM currently giving good guidance.

GEO Electron Environment	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ $1x10^8$	No	1	1	1	1
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	1	1

Figure 4: MOSWOC REFM.



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